Part II
The AMPA's Roadway Network

A. Introduction

Roadway networks consist of many different kinds of facilities. Not all of these facilities perform the same function. To differentiate between these various kinds of functions, roadways are divided into five groups, or functional classifications. These are freeways and expressways, principal (or major) arterials, minor arterials, collectors, and local streets. A brief description of each functional classification is provided below. Map II-1 shows the AMPA's current functional classifications. Table III-2 in Part III shows the current number of lane miles in the AMPA for each functional class.

Freeways and expressways are interstate and interstate-type highway routes with designs that allow speed limits of more than 45 mph. Freeways and expressways:

- access is limited to intersections and interchanges that are specifically designated on the Long Range Roadway System Map[3]
- provide for regional trips and through trips
- are four or more lanes, divided by medians
- provide freeway access via interchanges only, and expressway access via interchanges or intersections, depending upon turn volumes
- have a high degree of buffering and separation from adjacent land uses
- have right-of-way widths of at least 156 feet

Principal arterial streets are major routes that connect subareas within the urbanized region. Principal arterials:

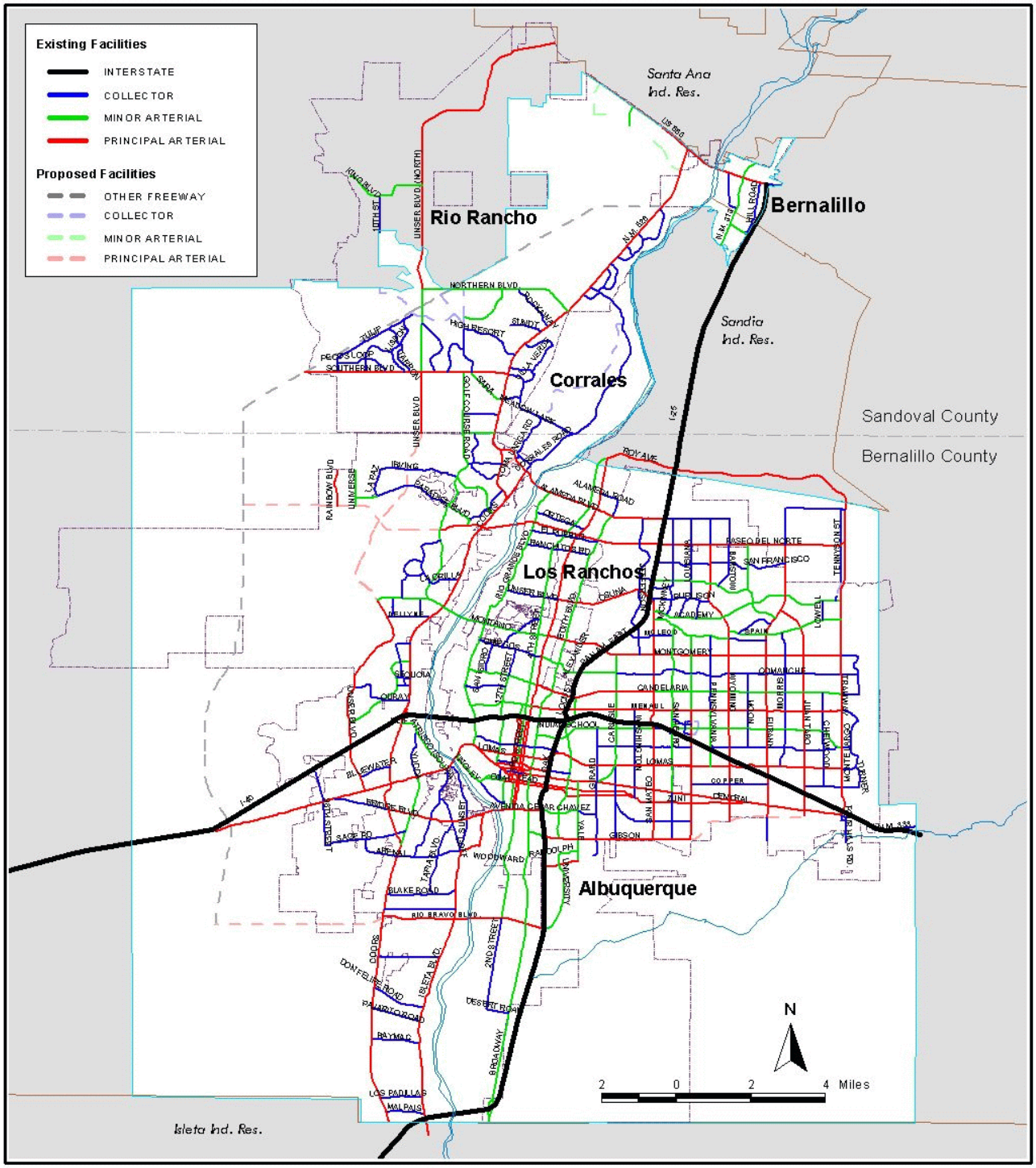
- provide access to activity centers
- serve outlying satellite communities or provide access to the urbanized region from outlying rural areas
- are continuous or long-distance and may cross major topographic or man-made barriers, such as rivers and interstate highways
- have designs or abutting land uses that permit relatively high speed operation (35 mph or higher)
- have access restrictions (limitations on curb and median cuts)
- include through streets in a downtown area
- have a typical right-of-way width of 156 feet

Minor arterial streets are transportation facilities that are shorter than principal arterials. These facilities generally contain only one trip end in an area through which the street passes. Minor arterials:

- tend to be continuous, long-distance routes that carry intermediate length (1-3 mile) trips
- border land uses that are mixed, possibly with direct driveway access

[3]This map is available from MRGCOG.

Map II-1
Roadway Functional Classification System



- connect abutting urban communities

or neighborhoods
- provide access to the principal arterial system
- provide access to major regional facilities that are not part of an activity center (e.g. regional parks and athletic facilities)
- are shorter in length than principal arterials but may cross major topographic or man-made barriers, such as rivers and interstate highways
- connect two principal arterials over a short distance
- have a typical right-of-way width of 86 feet

Collector streets are distinguished from local streets by the fact that they carry longer distance trips. They are also better connected to the principal and minor arterial system than local streets. Collectors are relatively short routes with at least one trip end in the area served by the route. Collectors:
- provide access to the arterial system
- connect principal and minor arterials
- have trip lengths that are relatively short (less than one mile)
- do not provide driveway access in residential areas
- in commercial and industrial districts, provide for internal circulation as well as driveway access
- in commercial districts, are characterized by high volumes of turning traffic and numerous local delivery vehicles
- in industrial areas, primarily provide access to activity concentrations or are characterized by heavy truck traffic and industrial work trips
- have a typical right-of-way width of 68 feet

For more information about roadway functional classifications, see *Future Albuquerque Area Bikeways and Streets*, MRGCOG, document number SPR-268[4].

B. Monitoring Traffic Conditions

1. Consolidated Traffic Counting Program

Monitoring traffic conditions is an ongoing responsibility of the Middle Rio Grande Council of Governments (MRGCOG). As part of this monitoring effort MRGCOG conducts traffic counts on all roads classified as collectors or higher (see Part II-A) in Bernalillo, Valencia, Sandoval, and Torrance counties.

The collected traffic data is used to support various transportation planning activities, such as monitoring changes in travel patterns and roadway usage over time, validating and calibrating the regional traffic forecasting model, performing air quality analyses, supporting project development and roadway design, and performing congestion analyses as well as analyses to determine the need for school crossings and school bus transportation.

In addition, the collected data is used to produce annual Traffic Flow Maps of the AMPA and outlying rural areas. These maps show the volume and distribution of traffic on the roadway network.
The 2000 Traffic Flow Map for the AMPA is

[4]This document contains the Long Range Roadway System Map and its Addendum. The Addendum includes information such as future functional classification, exceptions to the standard right-of-way widths, intended access control policy, and specific access control points.

included at the back of this document. Poster size Traffic Flow Maps are available at the MRGCOG offices.

Most traffic counts are conducted using portable traffic monitoring devices with rubber tubes that stretch across the roadway ("tube counters"). MRGCOG maintains a coverage schedule which lists all locations that are to be counted on a regular basis. Most roadway segments included on the traffic counts coverage are counted once every three years. River crossings are counted every year. This means that approximately 800 locations are counted per year. About three-quarters of these are in the AMPA, with the balance being in the rural part of the four-county area. To remove seasonal variation in count data, the month in which each location is scheduled to be counted is consistent with the month of the previous count at that location. Elimination of seasonal variation enables better comparison between current and previous counts.

Figure II-1 Tube Counter

Tube counters have vehicle class capability: they are able to determine the mix of vehicles (e.g. cars, trucks, etc.) on a roadway segment in addition to the volume. Approximately 10 percent of all counts conducted record vehicle classification information as well as volume data[5].

MRGCOG also conducts intersection turning movement counts. Under this program data is collected that reflects the turning movements vehicles make at intersections. All signalized intersections in the City of Albuquerque are counted on a regular basis. Special intersection counts are conducted at member governments' request.

a. Directional Traffic Counts

methodology

As described above, most traffic counts are performed using tube counters (see Figure II-1). In order to record average weekday volumes of traffic, these tube counters are set out for a minimum of 48 hours per location. They are placed on either Mondays or Tuesdays, and picked up on Wednesdays or Thursdays, respectively. The counters record the number of axle "impacts" from each vehicle as it crosses the tube. It subsequently divides the number of axles by two to obtain the number of vehicles that crossed the tube. This data is then summarized and stored in 15-minute intervals.

After a location has been counted, an electronic file is produced and brought back to MRGCOG for processing. The data is first downloaded with software provided by the manufacturer of the counter and subsequently processed using software that was developed in-house. This software performs quality control checks which allow staff to examine the distribution of traffic volumes over the course of a day as well as to compare it both numerically and graphically to past counts at the same location. The software also checks

[5]See Part III D for more information about vehicle classification counts.

the count for missing data and makes sure there are no other problems which could disqualify the count from meeting the standards (see standards section below). Naturally, the software cannot account for all variation in volumes and professional judgement often comes into play.

Most traffic counts are conducted using tubes, but two other data collection methods are also used to gather traffic volume data.

The first method uses permanent loops, which are installed and maintained by the New Mexico State Highway and Transportation Department (NMSHTD) at various interstate locations where traffic volumes are such that it is impossible to place tubes across the roadway. Traffic volumes are recorded by electronic inductance loops embedded in the roadway. These loops are connected to pull-boxes which are placed by the side of the road. Tube counters are connected to the permanent loops by placing them inside these pull-boxes. The tube counters collect the data and the subsequent method for processing the data is identical to the one applied to regular tube counts.

The second method uses permanent counters, which are also installed and maintained by the NMSHTD. These have been installed at several locations within and outside of the AMPA. Permanent counters also use inductance loops embedded in the roadway to detect traffic volumes. However, permanent counters ideally operate 24 hours a day and 365 days a year, thus providing much more comprehensive data than either tube counters using road tubes or tube counters connected to permanent loops. Permanent counters are not used more extensively because they are very costly to install, and require telephone lines for communications and electrical power on site. In addition, their maintenance can be time consuming and costly.

adjustment factors

Adjustment factors are applied to 48-hour tube counts in order to make these short-term counts representative of the volume of traffic present on an average weekday during a certain year. These factored volumes are called Annual Average Weekday Traffic (AAWDT) volumes.

Permanent counter data is extremely valuable because it gives an indication of the seasonal variation in traffic volumes. Data taken from them is therefore used to generate seasonal (monthly) adjustment factors (MAFs). These factors are usually established for two specific regions: areas located within the urban zone of influence and areas located within the rural zone of influence.

Monthly Adjustment Factors are applied to traffic counts taken with tube counters to correct for the seasonal variation which occurs in traffic volumes over the course of a year. For example, counts taken during the winter months usually need to be factored *up* to arrive at a volume that is more representative of the entire year, since volumes in the months of November, December, January, February, and March are often lower than volumes during the rest of the year. Traffic counts taken during the summer months, on the other hand, usually need to be factored *down*.

Loop Correction Factors (LCFs) are also applied to raw data counts. These are calculated by using all vehicle classification counts in an area and determining the average percentage of heavy commercial vehicles present on roadways in that area. The Loop Correction Factors are calculated for ten districts and are applied to raw data counts to

Figure II-2 2000 Adjustment Factors

Monthly Adjustment Factors		
Month	Urban* (3 yr avg)	Rural* (3 yr avg)
01/2000	1.045	1.297
02/2000	1.012	1.198
03/2000	0.998	1.062
04/2000	0.987	1.057
05/2000	0.978	0.934
06/2000	0.952	0.894
07/2000	0.974	0.827
08/2000	0.971	0.913
09/2000	0.984	0.912
10/2000	1.004	0.899
11/2000	1.048	1.024
12/2000	1.057	1.209

Average Growth Factors		
District Code	AGF	LCF
0	1.033	0.974
1	1.040	0.974
2	1.026	0.982
3	0.994	0.982
4	1.019	0.982
5	1.016	0.982
6	1.013	0.972
7	1.017	0.974
8	1.041	0.949
9	1.011	0.974
region	1.014	0.976

District Codes	
0	Far North Valley and Jefferson Corridor
1	Northwest Mesa, Rio Rancho
2	Upper Northeast Heights.
3	Southeast and lower Northeast Heights
4	Southwest Mesa, Valley west of the river
5	CBD
6	East Mountains
7	Valencia County
8	Rural Sandoval/Torrance counties
9	North Valley, Southeast Valley

adjust for the percentage of heavy commercial vehicles. These factors need to be applied because tube counts register each axle impact and count every pair of axles as one vehicle. The amount of traffic on a roadway could be greatly exaggerated if vehicles with more than two axles were not accounted for.

The third type of adjustment factor employed by MRGCOG, Average Growth Factors (AGFs), is only applied to count data not gathered in the current year. The growth factors are based on tube count data. By comparing the most recent counts at a certain location to previous counts taken at the exact same location, a growth rate for that location can be determined. These growth rates are subsequently combined to generate average growth factors for the same ten districts for which LCFs are calculated. AGFs are then used to adjust the data for those roadway segments that were not counted in the current year. To accomplish this, the previous year's AAWDT for a given location is simply multiplied by the appropriate growth factor.

The 2000 adjustment factors are shown in Figure II-2.

In general, a current year count is adjusted as follows:

AAWDT = (Vol/2) * MAF * LCF

(Vol = 48-hour 2-way vol from a tube count)

Locations not counted in the current year are adjusted as follows:

$$AAWDT_t = AAWDT_{t-1} * AGF$$

standards

Methods and procedures for collecting, processing, and reporting traffic monitoring data are governed by the New Mexico State Traffic Monitoring Standards (NMSTMS). These standards are reviewed and updated annually by representatives of the NMSHTD, metropolitan and regional planning organizations, local governments, and consultants involved with the collection of traffic data within the state of New Mexico.

Traffic Monitoring Standards for processing traffic count data include the requirements that a minimum of 48 consecutive hours of data be collected, and that a traffic volume of zero must not occur for eight or more consecutive hours. Counts that do not meet these requirements are non-standard. In addition, counts that are more than three years old are obsolete and can no longer be called standard under the Standards. The lack of current counts at certain locations can often be explained by roadway construction projects and other problems when the count was scheduled to occur.

The Traffic Flow Maps[6] show the AAWDTs for both directions of travel combined. On the maps, a clear distinction is made between data that is in compliance with the State Standards (standard data) and data that is not (non-standard data). Volumes that are shown as non-standard on the maps may be based on counts which failed to meet the standards, on obsolete counts, or on professional judgement. Professional judgement may be an estimate based in some indirect way on good counts. An excellent example of the latter are non-standard interstate volumes, where freeway ramp counts are used in combination with mainline counts taken on different dates at upstream and downstream locations to estimate intermediate mainline volumes.

data storage

Traffic count data is stored in several forms. Hard copy count reports, which show the collected data in 15-minute intervals, are printed and filed for each count location. In addition, MRGCOG maintains several databases which contain traffic flow information, including various summaries and extracts based on the raw data counts.

An example of a typical short term hard copy count report is provided in Figure II-3. The report presents raw traffic volume data by direction in 15-minute intervals. The first page shows the southbound direction of travel, while the second page shows the northbound direction of travel at the same location. Both pages have highly informational headers which include facts like *where* the count was taken, *when* the count was taken (including the date plus the start and end times), and the *quality* of the count (whether or not the data met the state standards).

Presented at the bottom center of each page are the 48 hour volume, average daily volume (48 hour volume divided by two), and average peak hour volumes for each direction of travel.

The bottom right of the first page shows the 48-hour volume and average daily volume or Average Weekday Traffic (AWDT) for both directions of travel combined. Below the

[6]The 2000 AMPA Traffic Flow Map is included at the back of this document.

Figure II-3
Daily Traffic Count Report – Page 1

MIDDLE RIO GRANDE COUNCIL OF GOVERNMENTS — Thursday, June 14, 2001

TRAFFIC COUNTS SUMMARY TABLES

CARLISLE SOUTH OF LOMAS / BERNALILLO — **Standard plus data**

COG ID: 253842
STATE ID: CFL5014Z002.028 11DA

Start Time: 14:15
End Time: 14:45

Start Date: 05/01/01
End Date: 05/03/01

Direction: SBD

DAY 1

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
00	18	7	10	7	3	17	31	58	69	49	81	66
15	21	6	13	5	6	19	30	72	65	79	71	65
30	10	12	6	4	6	13	35	75	61	56	68	86
45	15	10	6	4	7	21	47	69	73	78	70	97

peak 15 min time & volume = 9:15 79 peak hour start time & volume = 7:15 285 peak hour factor= 0.90

	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
00	93	90	84	82	93	102	83	65	55	73	52	36
15	87	82	72	76	85	78	78	57	39	63	31	15
30	90	64	73	100	98	90	63	51	52	57	44	21
45	72	82	70	92	97	83	76	65	53	49	38	20

peak 15 min time & volume = 17:00 102 peak hour start time & volume = 16:15 382 peak hour factor= 0.94 total volume = 5068

DAY 2

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
00	20	11	11	6	9	15	24	44	57	75	67	69
15	27	8	6	2	3	15	29	56	67	64	58	88
30	16	7	2	3	6	13	51	66	67	72	67	68
45	12	4	6	3	9	11	60	63	66	74	71	96

peak 15 min time & volume = 9:00 75 peak hour start time & volume = 9:00 285 peak hour factor= 0.95

	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
00	80	73	86	88	91	105	85	72	54	56	45	20
15	88	80	76	93	84	95	77	54	52	54	33	29
30	84	78	72	90	86	88	94	72	51	58	31	18
45	82	77	83	88	100	98	83	55	38	48	25	26

peak 15 min time & volume = 17:00 105 peak hour start time & volume = 16:45 388 peak hour factor= 0.92 total volume = 5039

48 Hour Volume SBD	=	10107	48 Hour Volume	=	20236
Average daily volume SBD	=	5053	Average daily volume	=	10117
AM peak hour average	=	285	LCF	=	0.982
PM peak hour average	=	385	MAF	=	0.978
Preliminary AAWDT	=	9716			

page 1

Figure II-3
Daily Traffic Count Report – Page 2

MIDDLE RIO GRANDE COUNCIL OF GOVERNMENTS — Thursday, June 14, 2001

TRAFFIC COUNTS SUMMARY TABLES

CARLISLE SOUTH OF LOMAS / BERNALILLO — **Standard plus data**

COG ID: 253842 — Start Time: 14:15 — Start Date: 05/01/01
STATE ID: CFL5014Z002.028 11DA — End Time: 14:45 — End Date: 05/03/01

Direction: NBD

DAY 1

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
00	14	13	3	4	7	12	22	47	66	68	57	59
15	13	8	3	4	4	15	34	63	61	48	62	78
30	13	9	3	2	7	10	42	81	55	65	49	74
45	14	8	7	4	6	19	40	76	72	66	77	74

peak 15 min time & volume = 7:30 81 — peak hour start time & volume = 7:15 286 — peak hour factor= 0.88

	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
00	96	91	74	89	110	103	67	76	62	51	45	20
15	96	92	95	85	95	96	92	60	55	46	50	15
30	98	85	94	88	114	106	69	39	47	58	32	17
45	87	99	79	107	101	95	74	61	52	48	32	17

peak 15 min time & volume = 16:30 114 — peak hour start time & volume = 15:45 426 — peak hour factor= 0.93 — total volume = 5098

DAY 2

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
00	10	6	10	4	4	16	22	63	68	54	64	57
15	11	9	6	7	13	7	34	61	44	58	62	71
30	10	10	4	5	5	17	38	85	57	57	68	78
45	12	4	3	1	10	9	43	82	72	59	86	84

peak 15 min time & volume = 7:30 85 — peak hour start time & volume = 7:15 296 — peak hour factor= 0.87

	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
00	97	82	103	90	117	96	86	68	63	49	40	33
15	86	89	88	83	109	105	51	48	51	41	26	21
30	95	68	85	108	101	96	66	58	52	58	32	20
45	104	63	83	111	107	88	57	44	51	57	32	13

peak 15 min time & volume = 16:00 117 — peak hour start time & volume = 15:30 445 — peak hour factor= 0.95 — total volume = 5031

48 Hour Volume NBD = 10129
Average daily volume NBD = 5064
AM peak hour average = 291
PM peak hour average = 435

page 2

average daily volume are the Loop Correction and Monthly Adjustment Factors used to calculate the Preliminary Annual Average Weekday Traffic (AAWDT), which is displayed below and to the left of the factors. It is called preliminary because the actual adjustment factors for the year are not available until after the end of the year, when all the permanent counter data has been collected and analyzed. The factors used for the preliminary AAWDT are the most recent ones available. Since the Traffic Flow Map reports *final* AAWDTs, the process of determining the volumes to be displayed on the map cannot begin until after the definitive adjustment factors for the year are available.

b. Turning Movement Counts

methodology

Turning movement counts are conducted manually using visual observation and a hand held electronic board (see Figure II-4). All signalized intersections in the City of Albuquerque (more than 500) are counted on a regular basis. Approximately 200 intersections are counted each year. Turning movement counts produce data that reflects the number of vehicles at an intersection turning left, right, right on red, or going straight.

These counts are collected in 3 three-hour intervals on the same day. The count periods are:

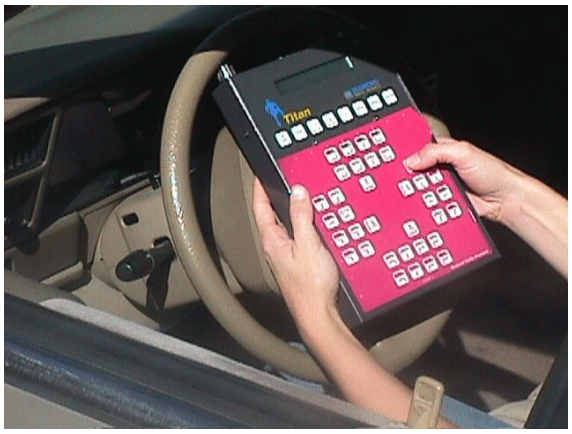
6:45 a.m. - 9:45 a.m.
11:00 a.m. - 2:00 p.m.
3:00 p.m. - 6:00 p.m.

These time periods are used to make sure that data is collected for the busiest hours of the day: the range of a.m. and p.m. peak periods as well as the midday traffic peak.

The data is collected for two vehicle classes: cars and trucks.

After a location has been counted, the data is processed in the office. Using in-house software, various quality checks are performed, including comparison of the data to tube counts taken on the approaches to the intersection to make sure that the volumes appear reasonable.

Figure II-4
Turning Movement Count Equipment



data storage

Turning movement count data is stored in several forms. Seven-page hard copy reports, showing the data in 15-minute intervals, and intersection schematics, showing the turning movement volumes for the a.m., midday, p.m. and total count period, are printed and stored in the MRGCOG offices. Hard copy reports are also printed for the City of Albuquerque. Summary data from these counts is saved to various files which are also maintained by MRGCOG. In addition, the data is uploaded to the Albuquerque Geographic Information System (GIS), where a.m. and p.m. data may be viewed.

2. Travel Time Data Collection

The 2000 travel time study was designed to follow the Congestion Management System (CMS) strategy defined in the baseline conditions performance report[7]. It was not designed to be a general travel time study that analyzed general road network characteristics. Instead, it focused on measuring roadway congestion. This approach requires a larger sample on a smaller number of streets than would a travel time survey. Hence, the overall roadway statistics for 2000 reflect that of the congested segments and do not represent the entire system. MRGCOG is investigating methods to expand the survey to enable system wide reporting during future surveys.

The 2000 congestion survey was designed to follow the same overall approach used in the 1993/1994 Travel Time Study, which formed the basis for the statistics used in the 1997 CMS baseline report. The basic procedure was to gather travel time data using straight line, approximate one mile segments, using the "floating car" technique. This technique requires the driver of the test car to approximate the median speed by passing as many vehicles as pass his/her vehicle. Detailed descriptions of methods and procedures are provided in MRGCOG's *1993/1994 Travel Time Study for the Albuquerque Urbanized Area*, document number TR-123.

Travel time data collection is intended to become a part of MRGCOG's ongoing traffic data gathering effort. The core of the travel time survey revolves around the same basic elements as the consolidated traffic counting program. Data is collected on the same roadway segments, identified with unique identifiers, called COGIDs. This information is stored and processed on base maps developed from the Albuquerque GIS. As a result, the data can be matched and used in conjunction with other traffic data for analysis.

Several additional data fields were added to facilitate the objectives of the CMS. Most COGID-defined roadway segments are too short to provide statistically reliable travel time data. A CMS identifier field was added to provide a method to aggregate the data and match it to the CMS base network. These field definitions and reporting purposes are defined in the 1997 *Albuquerque Congestion Management System, Baseline Conditions Performance Report*, MRGCOG, document number TR-128.

A key improvement introduced in the travel time survey in 2000 was the use of Global Positioning Satellite (G.P.S.) receivers. The 1993/1994 travel time report presented data collected with a tape recorder and stop watch. This information was transposed onto data sheets. Times were then hand calculated and entered into a GIS data base. The 2000 survey used G.P.S. units, which allowed travel times to be continuously recorded in one-second intervals. The G.P.S. units also allowed the user to indicate delay caused by traffic lights, roadway incidents, or other predefined delay events.

The G.P.S. units' software cleaned the data of distortions and output the point data in the correct map datum. The G.P.S. point-to-point data was then processed with in-house

[7] *Albuquerque Congestion Management System, Baseline Conditions Performance Report*, MRGCOG, document number TR-128

developed software. This information was subsequently geographically matched to the CMS network. This first year has provided a great deal of new information. The newly acquired data was used to create the maps and charts depicted in Part IV of this document. More information will emerge as the software is refined and developed to improve and streamline data processing from the G.P.S. units.